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Investigation of Applicability of Global Data Sets for Regional River Runoff Prediction using a Land Surface Model

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At the moment there are a lot of global data sets containing hydrometeorological data, land use information, soil and vegetation characteristics with 1-degree spatial resolution. Such resolution is supposed to be crude for local and regional applications. However, there are many places all over the world where global data sets represent the only source of information for model simulation of different components of energy and water cycles. As such, it is reasonable to try to apply the global data for runoff prediction in ungauged basins. What will be the reliability of such predictions? Uncertainties in which data will be crucial for final results? The present work is an attempt to investigate these issues on a regional scale. For this purpose, twelve river basins with different hydrologic and climatic conditions (with an area ranging between 1021 and 4425 km^2) were selected within the United States. The simulations of river runoff for these basins were performed at 3-hour time step for 10-year period (1986-1995) using the land surface model SWAP (Soil Water- Atmosphere – Plants) (Gusev and Nasonova, 1998, 2002, 2003). In so doing, the following data sets were used:

• several global 1-degree data sets, produced within the framework of the Second Global Wetness Project (GSWP-2). The global data sets include (i) near-surface meteorological data (incoming shortwave and longwave radiation, air temperature and humidity, atmospheric precipitation, air pressure and wind speed), based on reanalyzes and gridded observational data used in ISLSCP (the International Satellite Land-Surface Climatology Project) Initiative II, and (ii) the land surface parameters (soil and vegetation characteristics);

• regional forcing data and the land surface parameters for each of the twelve basins.

The forcing data were distributed within the framework of the Second MOPEX (the Model Parameter Estimation Experiment) Workshop, the values of parameters were derived by ourselves on the base of data on spatial coverage of each of 16 USDA soil type and each of the 14 University of Maryland vegetation type in the basins. The hydraulic conductivity at saturation was calibrated against measured streamflow for 1960-1979.

The results of application of regional and global data sets were compared with each other and with observations. Analysis of the results allowed us to reveal the applicability of global data for regional runoff simulations.